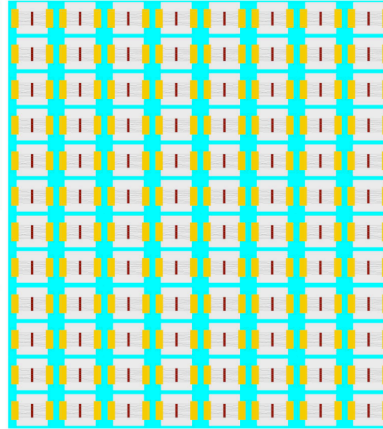
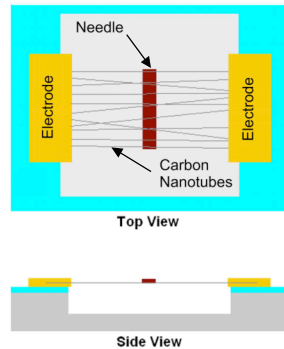


# NanoCompass: A Technology for Magnetometry in Space and on Earth



presented by

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## NanoCompass: A Nano-Scale Sensor

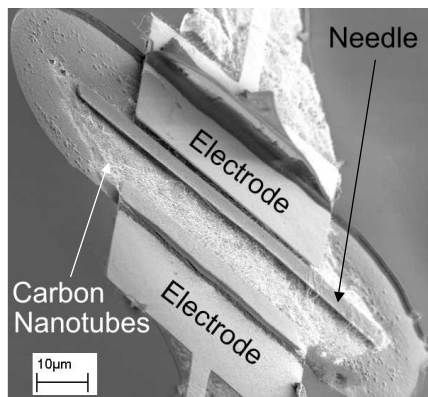


Uses carbon nanotubes to reduce:

- size
- weight
- power requirements

while increasing capabilities:

- spatial resolution
- sensor density (increased data)
- parallel measurements



Features	NanoCompass (compared to state-of-art fluxgate)
Size	100,000 times smaller
Weight (mass)	99% lighter
Power needs	Requires 0.1%–1% the power
Resolution	1,000 times higher

Example application: Magnetic touch reader  
*Easy, reliable to use*  
*At least 10x more data stored*  
*Magnetic card has longer life*

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## NanoCompass: A Nano-Scale Sensor



- **Terrestrial applications**
  - Handheld/sensor net for military and Homeland Security
    - RFID “smart dust” to detect armored vehicle movements
    - Low power, small size → *many sensors for good signal coverage*
  - Magnetic data storage readers
    - Touch cards possible with low-cost magnetic storage
    - Parallel reader → *easy to read, longer life*
  - Small personal compasses and GPS devices
    - Can be integrated into cell phones, PDAs
    - Low power, small size → *compatible with existing battery technology*
- **Magnetometers are also used for:**
  - Portable oil, gas, and nuclear monitoring devices
  - Health care diagnostics (MRI)
  - Small probes for integrated circuit quality assurance
- **Competing Technologies**
  - SQUIDS (Superconducting Quantum Interference Devices) – *cryogenic operation*
  - Fluxgate magnetometers – *bulky, low spatial resolution*
  - Hall sensors – *milliTesla sensitivity, 10s of mW power consumption*

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## Market



- **Revenues in magnetic sensor components industry**
  - totaled ~\$1B in 2005
  - could reach ~\$2B in 2012 (F&S 2006)
- **Key market drivers**
  - Growth of automotive electronic control systems
  - Increasing demand for computer and electronic products
  - Short shelf-life of consumer electronic products
- **Key technical attributes: NanoCompass**
  - ❖ *Smaller size*
  - ❖ *Lighter weight*
  - ❖ *Better performance*
  - ❖ *Micromachining approach uses widespread microfab infrastructure*

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## Plan Forward



- **Commercialization plan**
  - *Prototype development*: September 2007
  - *License technology* for commercial/terrestrial applications
  - *Prototype optimization*: September 2008
  - *NASA as customer* for commercialized NanoCompass
- **Partnership opportunities**
  - Low noise, low power, low mass electronic components
    - *power supplies*
    - *lock-in amplifiers*
    - *multiplexing approaches*
  - Packaging for contamination mitigation
  - Facilities available to partners:
    - *Detector Development Lab (micro- and nanofabrication)*
    - *Radiation Effects Facility*
    - *Carbon nanotube growth facility*

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## Contact Information



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- Provisional patent application filed in June 2006
- Funded through internal NASA GSFC R&D funds

*For more information on partnership and licensing  
opportunities, please visit*  
<http://ipp.gsfc.nasa.gov/ft-tech-NanoCompass.html>

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